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Bruun, Charlotte

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Monetary Policy in an Agent-Based Monetary Production Economy

Charlotte Bruun[1]

Aalborg University, Denmark
cbruun@epa.aau.dk

1 Introduction

Monetary policy has developed into a question of defining optimal rules. Often such rules are developed and evaluated in a general equilibrium setting - with or without New Keynesian imperfections (eg. Woodford 2003). However, the question of making room for money in a general equilibrium setting remains unsolved. Other New Keynesian have adopted a credit approach to the question of monetary economics (eg. Stiglitz and Greenwald 2003), but again, without leaving the general equilibrium setting[1]. Conducting monetary policy, however, cannot await the answer to such fundamental questions. Further more the question of monetary policy is very hard to settle from an empirical point of view. An alternative procedure is to develop an agent based world as an alternative to the real world.

The question to be posed here concerns an evaluation of proposed policy rules based on a completely different model than the one in which the policy rules were defined. If the economy in which we happen to live is better described as a monetary production system rather than a general equilibrium system, will the policy prescription still work? Possible transmission mechanisms for monetary policy are evaluated, ie. interest rate effects on investment, private consumption and the stock market.

2 An Agent-Based Monetary Production Economy

A Monetary production economy is an economy where money is not primarily a means of exchange, but a factor of production. Money does not enter the scene once production has taken place and needs to be distributed between members of society - it is a prerequisite for production. As Keynes stated in his Tilton papers(**?**), in a monetary production economy, workers are not satisfied with a part of the product as reward for their labour - they demand a monetary wage, and they demand this

[1] See Rochon(1999) for a comparison between New Keynesian and Post Keynesian economics.

wage before the product can be sold. Thus entrepreneurs need money before they can start up production, and the exchange process on which general eqilibrium places its focus, is primarily a question for entrepreneurs of getting back the money paid out as wages.

The agent-based monetary production model follows the monetary circuit described above. A number of producers of consumption goods and investment goods, lend money in order to hire labour and produce. In this agent-based version the market for consumption goods is decentralized by letting consumer products be distributed to a cellular space on which consumers are situated. The market for investment goods is a list of investment projects from which producers pick.

A vital aspect of a monetary production economy is financial markets. Financial markets are not a means for transferring purchasing power from savers to investors since investors may obtain creditmoney without a preceeding act of saving. Financial markets may be perceived as a means of constantly re-evaluating the production capital, and a means for entrepreneurs as a group of getting back the money paid out as wages that have not been spent on the purchase of consumption goods.

All agents, workers and producers, acts on financial agents. In the model agents have to choose between holding short term credit or holding stock. Only producers may issue new stock, but all agents hold stock. The financial market is a list of offers to buy and sell.

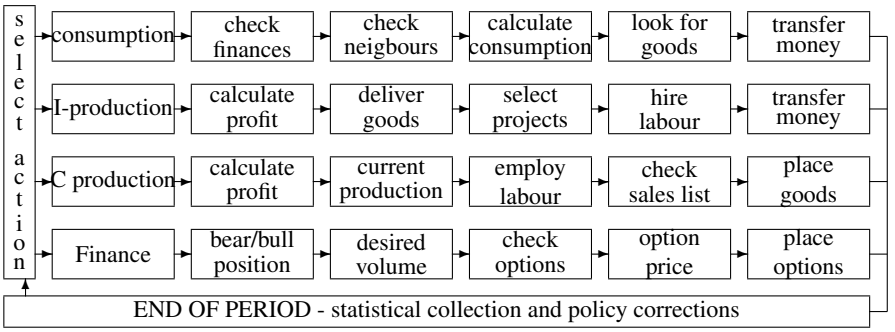

Fig. 1. Main decision procedures of the model

2.1 Production

The primary concern of producers is to obtain a monetary profit[2]. The profit of a producing unit is calculated as the change in financial position of the unit during one

[2] This is not at all self evident - as noted by McCauley(2004) *But one of Karl Marx's positive contributions was to remind us that the neo-classical model ignores the profit motive completely*

period. The capital goods as well as the financial assets held by the unit is evaluated at current prices as determined on the stock market. Following a profit may be obtained in the production sphere as well as in the financial sphere.

Last periods profits influence the production decision; a positive profit encourages the producer to increase production whereas a negative profit will have a negative impact on the level of production.

2.2 Consumption

Two main factors enter the decision to consume; the average consumption of the neighbours of the consuming unit and the financial position of the consuming unit. The neighbour concern enters the consumption decision in order to allow consumption a life of its own - it is not just a passive response to current income as in the simple Keynesian aggregate consumption function, or to expected future incomes as in New classical consumption functions. The dynamics of *keeping up with the Jones's* is, together with the producers strive for a monetary profit, recognized as the fundamental drive of capitalist production.

2.3 Financial Market

All agents, consumers as well as producers, buy and sell financial assets. All agents have a banking account with an overdraft facility. They may move in and out of the shortterm credit contract by buying and selling stock, Only producers can issue stock.

The stock market functions by a simple price adjustment mechanism. Besides buying and selling at prevailing prices, agent may place options to buy and sell. An overweight of buy options will cause prices to raise whereas an overweight of sell options will cause prices to fall.

At the stock market, stock issued by different producers are treated as homogenous - agents cannot tell one asset from another. But if a producer is declared bankrupt, only the agents holding his particular stock will loose.

2.4 The Transmission Mechanism

The potential transmission mechanism for monetary policy in the original model are not very strong. Interest rates do not enter directly into the decision procedures of consuming or investing agents. The dominant determinant of investment is current stock prices - to be regarded as an estimate of prospective yields. The dominant determinants of consumption/saving is current wealth and consumption by neigbouring consumers.

However, there is an indirect transmission mechansim through the financial market. The prospective yield of holding a stock is evaluated against interest on bank deposits. Changes in interest rates are thus likely to have an impact on stock prices, and following on production, investment and consumption decisions.

There is also a redistributive effect of changes in the rate of interest between creditors and debitors.

The price level is constant in the model....

3 Policy Experiments

3.1 Means of Monetary Policy

As in the real world, monetary authorities have no means of directly controlling the volume of money. They may, however, set the rate of interest. In setting the rate of interest they may use information on the rate of change of the volume of money, or the level of activity in the model.

3.2 The Money Stock as Policy Target

Following monetarist prescriptions, monetary authorities may attempt to control the volume of money by increasing interest rates when the volume of money is growing rapidly. In the simulation, interest rates are increased by 1% when a 10% increase in the volume of money is observed, and further increases if the growth in money stock is even more dramatic (se fig.2d). This approach is, however, not very successful in stabilizing the economy. The level of production does experience larger booms, but also more severe crashes (fig. 2.a), and the volume of money increases rather than decreases (fig. 2.c). Since the average rate of interest i smaller than in the base run without policy, this cannot be due to the general redistributive effect of increases in interest rates between debitors and creditors. But the timing of increases in interest rates may be vital; if an increase in the volume of money is due to the fact, that differences between creditors and debitors is increasing, raising the rate of interest will only make matters worse and increase benkrutcies.

3.3 Stock Prices as Target for Monetary Policy

It may be better for monetary authorities to target stock prices. Booming stock prices will have a positive impact on the level of production, investment and through a wealth effect also consumption. If it is possible to stabilize stock prices it may be possible to stabilize the economy. This can be done by means of changing the interest rate since holding interest bearing money is an alternative to purchasing stock. However, as depicted in figure 3, this policy is not more successful.

3.4 Comments on the Simulations

The simulations presented here are very root first approximations of the effects of monetary policy. Results may depend on the strength of the policy measures, the length of the historical period that monetary authorities take into consideration, etc. Thus refinement of the simulations and further verification is called fore. These first results, however, do indicate, that policy recommendations may be quite different coming from an agent-based monetary production model.

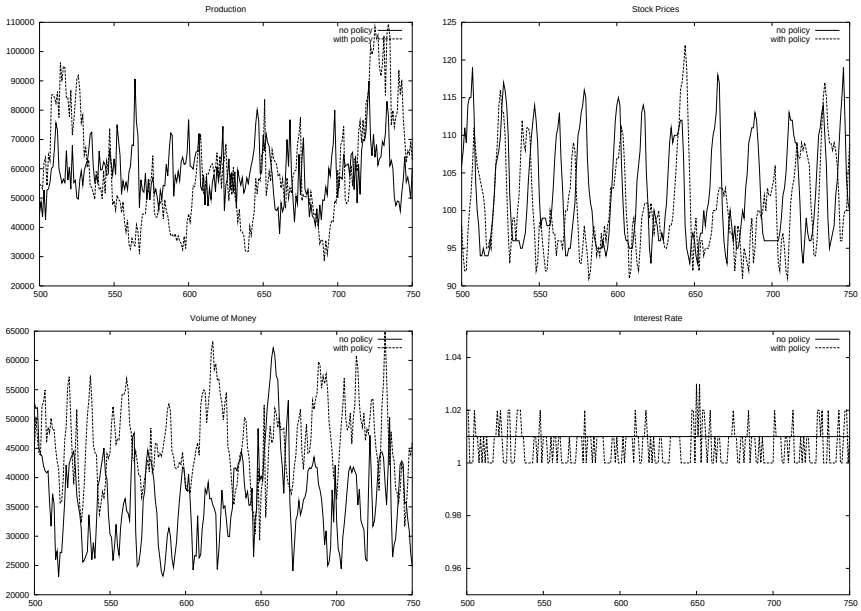

Fig. 2. Effect of monetary policy targeting the volume of money on (a) production, (b)stock prices, (c) volume of money and (d)the resulting rate of interest

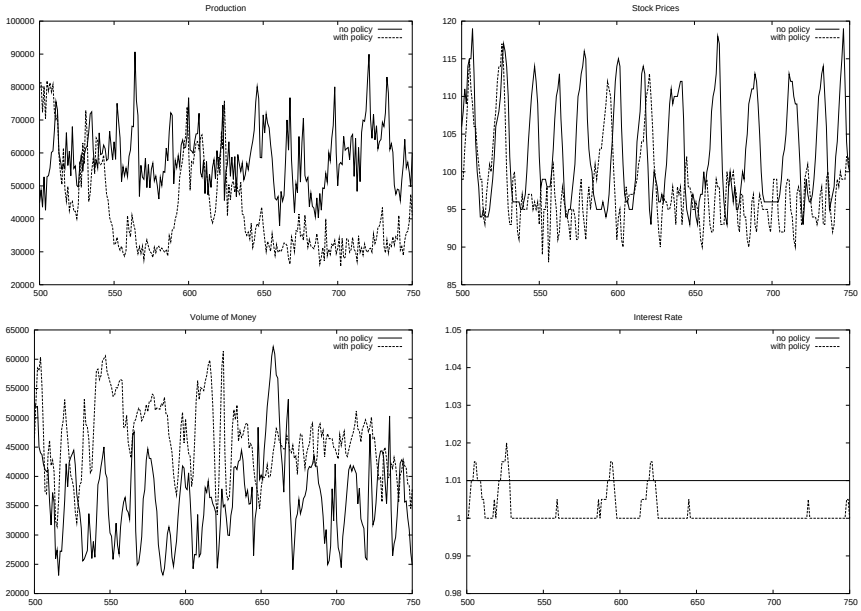

Fig. 3. Effect of monetary policy targetting stock prices on (a) production, (b) stock prices, (c) volume of money and (d)the resulting rate of interest

3.5 Conclusion and further work

The agent-based monetary production model may be extended in order to evaluate some of the policy recommendations based on New Keynesian Theory.

References

1. Keynes, J.M. (1931), Monetary Production.
2. McCauley, J.L. Dynamics of Markets - Econophysics and Finance. Cambridge University Press 2004.
3. Rochon, Louis-Philippe, Credit, Money and Production - An alternative Post-Keynesian approach. Edward Elgar 1999.
4. Stiglitz, J. and B. Greenwald. Towards a nem paradigm in monetary economics. Cambridge university press 2003.
5. Woodford, M. Interest and Prices - foundations of a theory of monetary policy. Princeton University Press 2003.